Nova Scotia
Research Foundation
Corporation

*Annual Report*
*1983-84*

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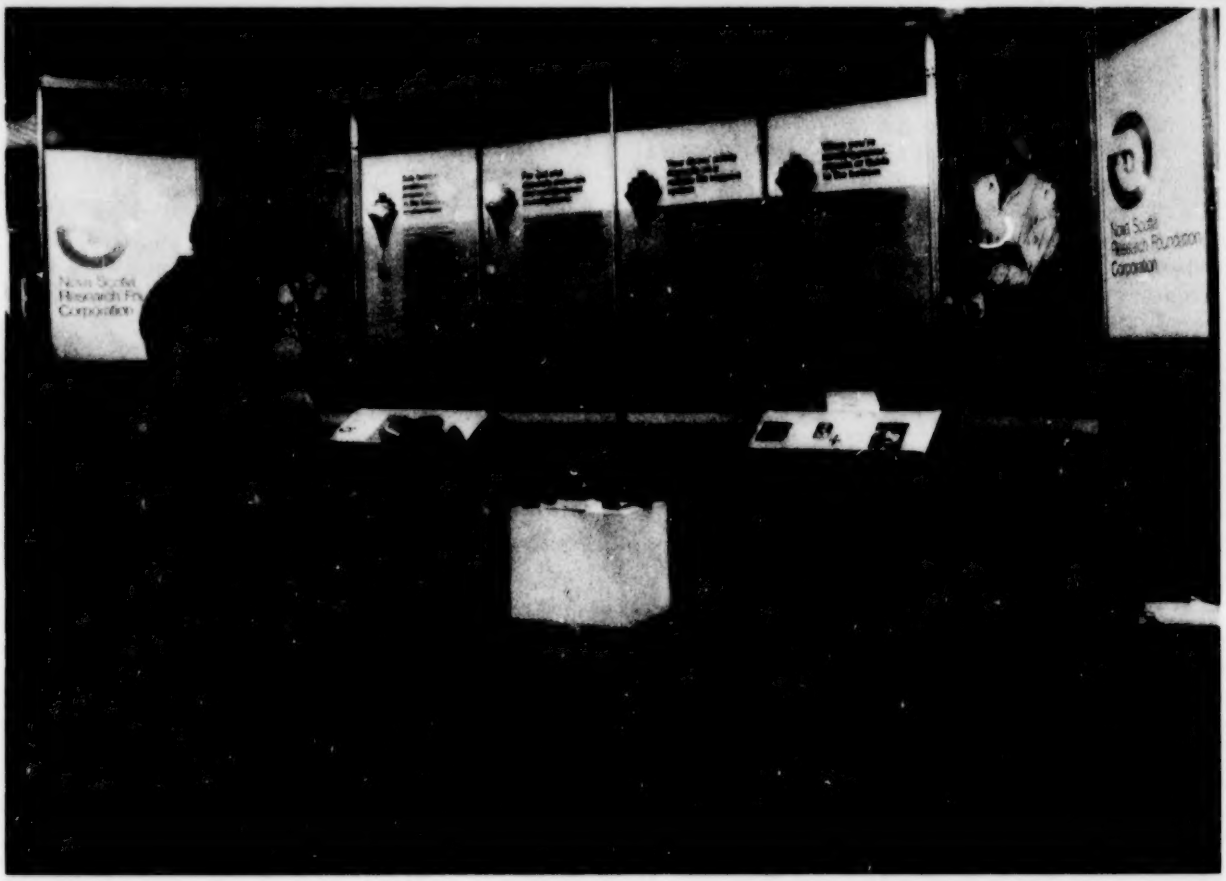

The Research Foundation was established in 1946 by the Province of Nova Scotia to assist in the province's economic development. In 1975 a new Act changed the name to the Nova Scotia Research Foundation Corporation with its objective being to "assist in the economic development of Nova Scotia by promoting, stimulating and encouraging the effective utilization of science and technology by industry and government". This change recognized the industrial orientation of the Corporation and the fact that approximately two-thirds of the Corporation's income is derived from contract Research and Development activities.

The Corporation, wholly owned by the Province of Nova Scotia, is controlled by a Board of Directors representing Nova Scotia's industrial, scientific and educational communities. The President and Chief Executive Officer is Mr. T.B. Nickerson. The Corporation has a full-time staff of 122 scientists, engineers, technicians and support staff occupying a well-equipped 5670-$m^2$ laboratory building and a 560-$m^2$ pilot plant on its four-hectare Dartmouth site.

Five operating divisions—Industrial and Information Services, Chemistry, Biology, Geophysics and Engineering Physics/Centre For Ocean Technology—carry out approximately 4,000 assignments each year for 600 companies and government departments. The Corporation's activities can be grouped into two approximately equal parts—assistance to industry in the solution of today's technical problems and new product/process innovation in response to tomorrow's opportunities. While the Corporation uses its capabilities to serve all sectors of Nova Scotia's industrial economy, particular emphasis is placed on technological support for the secondary manufacturing industry. The Corporation continues to emphasize the potential for ocean industry development in Nova Scotia.

The Corporation has assets of $7.6 million, including $4.3 million in buildings and equipment (valued at cost). Revenues for 1983/84 were $6.1 million. Over the past decade revenue has grown by 16 percent annually. In 1983/84, contracts contributed 59 percent of total income; investment income, 3 percent; and a grant from the Province of Nova Scotia, 38 percent. The grant is used to assist small companies unable to afford needed technological support and to monitor new technological developments which may be of particular relevance to Nova Scotia.

# Board of Directors

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Nova Scotia Research Foundation Corporation
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Tel: (902) 424 - 8670 Telex 019-22719

Honourable Roland J. Thornhill
Minister of Development
Province of Nova Scotia
Halifax, Nova Scotia

Sir:

I have the honour to submit the thirty-seventh Annual Report of the Nova Scotia Research Foundation Corporation.

Respectfully Submitted,

T. B. Nickerson, P. Eng.
President

Dartmouth, Nova Scotia
September 1, 1984

# President's Report

"Building Competitiveness", Nova Scotia's White Paper on economic development, emphasizes the ongoing need for industry to incorporate technological advances in both products and processes in order to remain competitive in world markets. This identification of technology as a key component of economic development should encourage a much more direct linking of science and technology into the overall economic development framework and provide strong direction for science and technology planning. We are pleased that the White Paper reaffirms the provincial government's support of the Nova Scotia Research Foundation Corporation and designates "NSRFC as the centre responsible for advising the government on scientific research and technological innovation in relation to development policies".

"Partners in Industrial Strategy", the Science Council of Canada's recent study of the Provincial Research Organizations, points out that these organizations serve a class of industries frequently overlooked by science and technology policy makers. This class, the very large number of small and medium sized companies who dominate Canada's manufacturing sector, generally do not have any in-house R&D capability. A principal objective of NSRFC and its counterparts in other provinces is to respond to the technology needs of this industry group. The White Paper's emphasis on technology reinforces the importance of this role.

Our ability to fulfill this role in the past year was limited by the continued impact of the economic recession which resulted in contract revenues being significantly below expectations. Stringent cost-cutting measures and support from the provincial government helped to minimize the financial loss while still maintaining the Corporation's technological and technology transfer strengths to provide a solid basis for the future.

The strong technology base is due in large measure to the wise guidance of Dr. J. Ewart Blanchard who retired in January after thirty-five years with the Corporation, including the last fifteen years as President. During Dr. Blanchard's years as President, which began when NSRFC moved into its then "new" facilities in 1969, the Corporation grew by 16 percent annually, financing this growth by developing contract R&D activities. The growth enabled the Corporation to develop new technical strengths relevant to the evolving needs of Nova Scotia industry. In 1983/84 the Corporation undertook over 4,000 assignments for 600 Nova Scotia companies, drawing on its own technical skills and those of others to help companies solve a wide range of technical problems.

In recent years the Corporation has expanded its new product R&D activity to encompass the complete innovation cycle from idea generation to product sales. This innovation activity developed from the Corporation's initiative in the early 1970's to capitalize on the opportunity for Nova Scotia industry to develop and manufacture ocean hardware for world markets to complement the Province's traditional resource harvesting activities. Today the Corporation, with hardware exports of over one million dollars annually, is a world leader in several specialized marine products and provides support for the innovation process in a number of companies.

Scientific programs related to the natural resource industries complement the Corporation's technical problem-solving and innovation activities. Under the direction of Mr. J.A. Brothers,

who retired in February after fifteen years as Director of the Chemistry Division, the Corporation developed, in conjunction with the Atlantic Research Laboratory of the National Research Council (NRC) and other university and research groups, a long-term program aimed at developing an economical method of removing the sulphur from Nova Scotia coal. Success in this program would significantly increase the value of Nova Scotia's coal and reduce the sulphur dioxide emissions resulting from the burning of coal, the major energy source for the province's electrical generation program.

Also retiring during the year were Mr. John Campbell, a technical information officer, and Mrs. Margaret Bacon, with over twenty-five years' service in the Chemistry Division. The contributions of these individuals and all of the members of the staff and the Board of Directors of the Corporation have made possible the Corporation's substantial progress in the past few years.

While financial restraints affected all activities in the past year the Corporation was able to make important progress in several areas. Industry services were strengthened with the additional resources made available through NRC's Industrial Research Assistance Program (IRAP). In addition to the work of NSRFC's eight Industrial Technology Advisors the IRAP Program provided $417,500 of financial support to Nova Scotia industry for technical problem-solving and new product development activities.

Development of a new environmental conditioning system for the diving industry received financial support under the Industrial and Regional Development Program of the Federal Department of Regional and Industrial Expansion. The new product, to be introduced in mid-1984, should provide further opportunities for Nova Scotia industry to participate in the worldwide ocean hardware marketplace.

The Corporation strengthened its materials engineering group with the acquisition of two universal testing machines which extend the capability to undertake materials testing and research. This in turn will enable the Corporation to provide a more complete materials service to assist Nova Scotia industry.

The Applied Microelectronics Institute, a joint venture of NSRFC, the Technical University of Nova Scotia and Dalhousie University, installed a computer-aided design system to support the design and layout of electronic printed circuit boards. With this new facility the time required to lay out a printed circuit board is reduced from days or weeks to a few hours, greatly increasing designer productivity.

As noted in our 1982/83 Annual Report the Corporation is developing a five-year plan to identify longer term needs and plan how these needs can best be met. The White Paper, with its emphasis on technology, provides a framework for this planning. While the Corporation's long-range plan is not complete, several points have emerged as guidelines for the future:

1. The Corporation is uniquely suited to provide technical assistance to the hundreds of small and medium sized manufacturing companies who form the backbone of our industrial economy. NRC's IRAP Program, of which NSRFC is an integral part, is a cornerstone of this activity.
2. The Corporation's product innovation activities, emphasizing ocean hardware, provide many elements of support and stimulus for technological innovation in Nova Scotia industry.
3. The Corporation's science programs, mainly related to natural resources and their utilization, will evolve in response to the needs of, and with funding from, resource departments of government and the resource industries.
4. Coordination with other research laboratories and universities will be essential in order for NSRFC to maintain contact with the ever-expanding fields of technology which impact Nova Scotia industry.

Nova Scotia's economic outlook for the next few years, buoyed by the prospects of offshore oil and gas development, is projected by many to be among the brightest in Canada. The Corporation looks forward to its role in assisting industry to utilize technology to realize this potential and to establish the technological strengths needed to sustain long-term growth.

# Industrial and Information Services

*The Division provides, without charge, technical information and assistance to small manufacturing industries with a view to supplementing and advancing their technological capabilities. The National Research Council's (NRC) Industrial Research Assistance Program (IRAP) and the Energy Test and Information Centre (ENERTIC) Program of the federal and provincial energy departments play a key role in delivering these services to clients. The Division performs contract work on technical, marketing and operational research problems and administers the Corporation's technical library.*

## IRAP-C (Field Advisory Service)

IRAP is an NRC-supported program aimed at advancing technology and improving productivity, particularly in small manufacturers and processors. It is a client-oriented service delivered through site visits by Industrial Technology Advisors who are close to the needs of local industries while at the same time monitoring technical innovations applicable to Nova Scotia. Complementing this advisory service are several financial contribution programs designed to assist industry with technical problem-solving and developing new or improved products.

In 1983/84 Industrial Technology Advisors made 2,005 industry contacts which resulted in 2,156 technical inquiries. Typical inquiries covered: sourcing of raw materials, materials substitution, equipment calibration, bonding methods, identification and explanation of standards and information related to energy questions. In addition, 112 industrial engineering projects were undertaken. These projects provided in-depth assistance directed at improving productivity through the application of industrial engineering principles. Examples of projects included: materials handling, inventory control, costing, production control and plant expansions. Financial assistance provided to Nova Scotia industry during the year through the IRAP Contribution Programs increased to $417,500. The student program placed 36 students in industry, assistance was provided for work on 49 in-plant technical problems and six small-scale research projects and one large-scale research project were supported under the IRAP Programs.

## Contract Services

The contract services group continued its major emphasis in the energy field administering the ENERTIC Program on behalf of the provincial and federal energy departments. The ENERTIC Information Service answered 233 inquiries and substantially increased its energy information data base. Contract marketing studies were undertaken in the fields ranging from crafts to university extension courses. The Operational Research Group used a response time model to define optimal fire station locations for a municipality and continued promotion of microprocessor use in industry.

## Technical Library

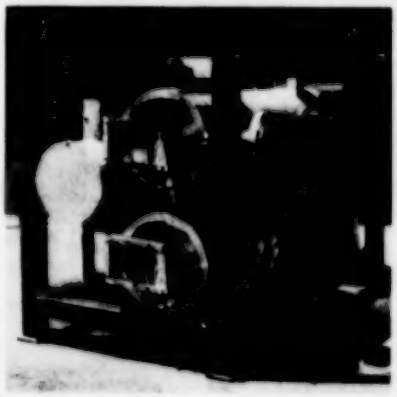
The technical library provides support fo NSRFC staff and industry through its own technical holdings and the use of external online data bases.

# Engineering Physics and Centre for Ocean Technology

*The electronic and mechanical engineering design skills of the Division are used to support and encourage the development of specialized industrial hardware suitable for manufacture in Nova Scotia and competitive in world markets. The Centre For Ocean Technology emphasizes development of ocean hardware.*

## Life Support Environmental Conditioning System

Development of a new dive chamber life-support system was undertaken with financial assistance from the IRDP Program of the Federal Department of Regional and Industrial Expansion. The life-support system provides environmental conditioning of the gases used in commercial diving deck decompression chambers. Precise control of gas purity, temperature and humidity is maintained by the system over a wide pressure range (surface to 500-m equivalent). The system utilizes the proven magnetic drive and gas circulator previously developed by the Division. The product, to be introduced in mid-1984, will complement and extend NSRFC's ocean hardware product line.



*External Environmental Conditioning System (ECS) for a diving chamber.*

## Fibre Optic Technology

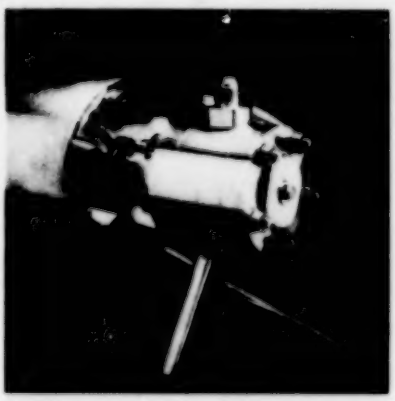
The Centre For Ocean Technology is working with Focal Marine Limited, Bedford, N.S., in the design and development of fibre optic swivels to extend the capability of NSRFC's electrical slip rings. Fibre optic communication is rapidly becoming a reality in marine systems, particularly in ROVs (Remote Operated Vehicles). The new product should assist NSRFC to respond to evolving market needs in marine systems.

## High Pressure Swivels

The Division designed and produced high-pressure (to 15,000 psi) water swivels compatible with NSRFC electrical slip rings. These swivels find application in remote operated vehicles employing very high pressure water jet cleaning systems for underwater cleaning and inspection of offshore platforms.

## Gas and Water Conditioning Systems

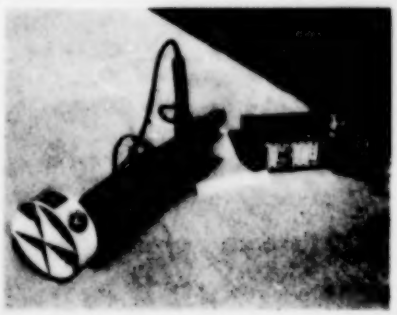
A major contract was completed with the Defence and Civil Institute of Environmental Medicine (DCIEM) to develop and supply a hyperbaric water and gas conditioning system. This system, now installed at DCIEM's Toronto facility, controls the temperature and purity of the water and gas used in the Deep Diving Simulator. The Division is under contract to Simon Fraser University in British Columbia for a similar system scheduled for completion in mid-1984.



*TYPE 135 High Pressure Fluid Swivel*

# Geophysics

*The Division includes a Marine Geophysics Section and a Ground Geophysics Section with expertise in field surveys, data interpretation and specialized equipment development. The Deep Towed Sub-Bottom Profiling System developed by the Division is used worldwide to examine the engineering properties of the sea floor for offshore pipelines and structures.*



*Sidescan Sonar option for Deep Towed System.*

## Equipment Development

Development of the Integrated Sidescan Sonar System as an option for the Deep Towed System was completed. The first units will be available in mid-1984.

Major improvements were made to the Borehole Logging System with the design and construction of a Digital Depth Speed Module. New Electronic Interface and Signal Routing Modules were incorporated in the electronics console to allow for electrical, gamma ray and density logging functions. A new Borehole Deviation Probe to measure the dip/azimuth of boreholes was put into service. Work is continuing on the development of a magnetic tape record-and-replay system for use with logging equipment.

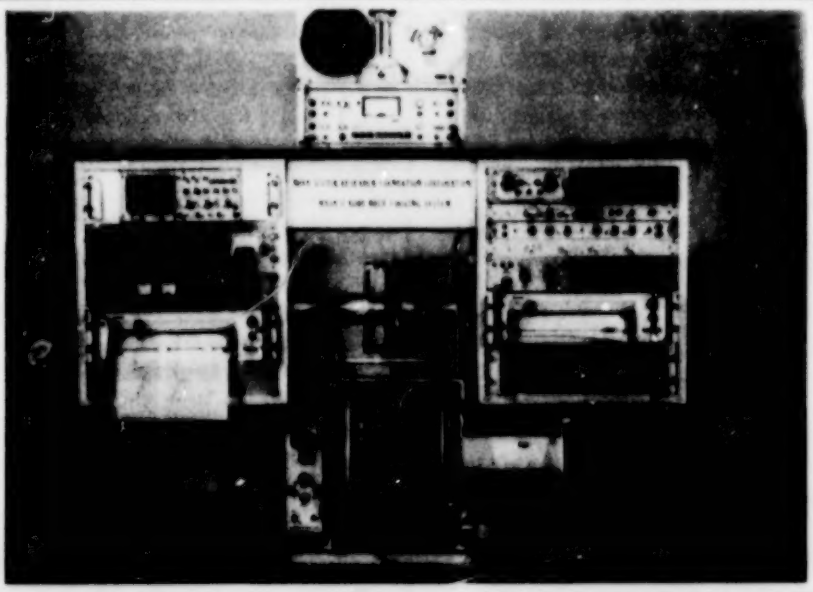
## Contract Surveys

Geophysical logging of coal exploration boreholes drilled by the Nova Scotia Department of Mines and Energy continued in the Springhill, Pictou and Sydney coal basins. Other boreholes logged included a stratigraphic hole near Antigonish and a water supply hole near Debert. The submerged wreck of a World War II Hawker Hurricane Fighter was successfully located by magnetometer in a lake in the Annapolis Valley area. A preliminary survey was carried out in conjunction with the Geological Survey of Canada to investigate the use of seismic techniques in detecting shallow, abandoned coal mine workings in the vicinity of Prince Mine near Point Aconi on Cape Breton Island. Gravity work included measuring new stations between North Sydney and St. Ann's Mountain over the western margin on the Sydney coal basin and computation of terrain corrections for gravity stations in the Sydney coal basin area.

Sidescan was featured in a survey conducted in Bedford Bay for the Bedford Waterfront Development Corporation to assess a site for reclamation and another for a source of dredged borrow material.

## Equipment Sales

Two Deep Towed Sub-Bottom Profiling Systems were sold to companies in the United Kingdom. This brings to five the number of NSRFC systems operating in the North Sea. Markets were developed for Seismic Streamers as a separate product. The agency network was extended to include coverage of the New England States.



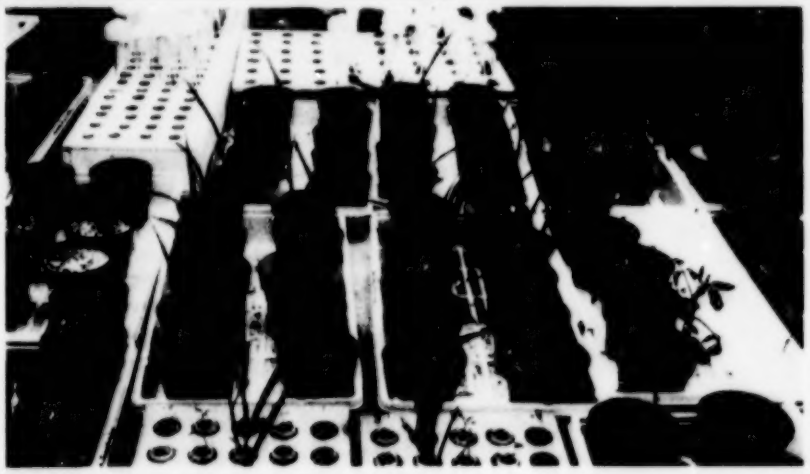
*Mark II Bore Hole Logging System*

*The work of the Division includes development of biological products and processes as well as the provision of biological services to industry and government. The Biology Division emphasizes research and development related to fermentation and microbial technology.*

## Fermentation

The Division is investigating the use of fermentation techniques to generate products of high value such as enzymes, biochemicals, foodstuffs or animal feed. Previous projects were concerned with the development of methods to produce a microbial enzyme (Lipase) and new bacterial polysaccharides.

In 1983/84 work continued on the digestibility-enhancing solid substrate fermentation of wheat and barley straw by the fungus *Pleurotus ostreatus*. The work involves the scale-up of laboratory experiments to produce large quantities of fermented straw for digestibility assessment in sheep feeding trails. This work is being carried out in collaboration with the Agriculture Canada Research Station in Fredericton.



## Mycorrhizal Fungi

Fungi associated with plant roots, forming so-called mycorrhizae, are known to be beneficial to forest trees and to agricultural crops. There is evidence that these symbiotic associations aid in the uptake of nutrients by the plant and in the protection against soil-borne disease.

Under contract with Agriculture Canada work is being carried out to assess the potential for improving alfalfa yields in maritime soils by inoculating the plants with mycorrhizal fungi. Experiments using a variety of local soils are conducted in the field and in the greenhouse.

Mycorrhizal fungi associated with coniferous trees were the subject of a project supported by the Canadian Forestry Service. The objective of this work is to select and culture various fungi and assess their effectiveness as inoculum for economically important coniferous trees. In future experiments suitable fungi will be used to inoculate container-grown conifer seedlings to assess their growth and survival after outplanting.

## Microbiology

The Division provided services to local companies in the fields of food and water microbiology and aquatic toxicity. Fresh fish, shellfish, canned and frozen foods, beverages, bakery products and confectionery were examined for the presence of pathogenic and non-pathogenic bacteria, yeasts and mold. Bacterial examinations were conducted on water supplies and waste waters.

# Chemistry

*The Division undertakes chemical and chemical engineering research and development and problem-solving for industry and government in Nova Scotia in response to existing problems and future opportunities. Process innovation and product improvement related to the utilization of the Province's natural resources form a major part of the work of the Division.*

### Coal Liquefaction

Process studies relating to high pressure donor solvent extraction of Sydney area coals were completed. Correlations were drawn between individual coal properties and product yields. Batch experiments illustrated that catalytic hydrogenation produces higher coal conversions and liquid yields than donor solvent extraction. An extensive program is currently underway to evaluate catalytic hydrogenation of Lingan coal in our bench-scale continuous-flow coal liquefaction unit. Future work will concentrate on two-stage processing designed to maximize the yield of distillate products. Coal liquefaction research and development is funded jointly by the Federal Department of Energy, Mines and Resources and the Nova Scotia Department of Mines and Energy.

### Coal Pyrolysis

An experimental program on the pyrolysis of coal-lime mixtures continued under a contract with the National Research Council's Atlantic Research Laboratory. Coal-lime pyrolysis permits the stripping of tars, liquids and gases from the coal while addressing the sulphur problem in Eastern Canadian coals. The primary objective of producing a low-sulphur char from high-sulphur coal was attained. The effects of various parameters on organic liquid yield were monitored. The next phase of work will include char reactivity measurements and the optimization of the overall process of coal-lime pyrolysis.

A preliminary engineering and economic assessment of coal-lime pyrolysis was completed. Pyrolysis systems ranging from bench to commercial scale were reviewed for their potential modification to coal-lime pyrolysis operation. Two product slate schemes were considered, one producing low-sulphur char, synthetic crude and gas and the other low-sulphur formed coke.

### Corrosion

Fatigue and corrosion fatigue studies of low-alloy steel, HY80, in natural seawater were carried out for the Defence Research Establishment (Atlantic) using an automated servohydraulic fatigue testing system. Work is underway to study the effects of protective cathodic current on the rate of crack propagation in a natural seawater environment.

### Ceramics

Development work supported by the National Research Council continued on high-technology ceramic components. An erosion test apparatus was built and operated to study wear properties. Larger-than-normal-size solid casts were successfully fabricated by a modified slip-casting technique. Future studies will assess the potential of various composite formulations to improve the mechanical properties of ceramic products.

### Product Innovation

Semiconductors as detectors of noxious gases are being investigated. A possible use may be found in monitoring silo gas in the farming industry. A device for extraction of PCBs from transformer oils is in the development stage. This unit should allow recovery of the transformer oil.

### Analytical Chemistry

Using a combination of classical wet methods and microprocessor-controlled instrumentation, the analytical laboratory responded to the analysis requirements of 175 clients. Support was provided to Nova Scotia industry in such areas as environmental monitoring, fish meal testing, wear analysis of lube oils, chemical analysis of ores and measurement of acid rain anions. A program was initiated to monitor the quality of pressure-treated wood products for Public Works Canada.

### Metallurgy

The increase in offshore exploration activity has generated new demands for specialized material services. In response to this need the metallurgy section of the division has expanded its capabilities with the acquisition of a 220 KIPS Material Testing Machine, a 20 KIPS Universal Testing Machine, an Impact Tester and a Vickers Hardness Tester. Test procedures are carried out according to DNV, Lloyds, ASME and ABS standards. During the year 127 contracts were completed for 41 clients. Contracts included mechanical testing, welding procedure and performance qualification tests, investigation of corrosion problems, heat treating operations and material failure analysis.

# Marketing

Sales of ocean hardware products and identification of evolving user needs are the main goals of the Marketing Group. Establishment of an agency network covering the United States market is nearly complete. New customers and product development opportunities in this market should occur in 1984. In Europe the agency network for sales and identification of product development opportunities continues to function effectively. Several Nova Scotia companies used the Corporation's agent network to gain initial access to international markets.

Sales of the electrical slip ring and fluid rotary union increased over previous years. The demand for slip rings and rotary unions in the diving systems market declined. However, this was offset by strong growth in the remote operated vehicle market where electrical slip ring sales increased substantially.

Geophysical equipment sales were the result of a joint marketing effort by the Marketing Group and Geophysics personnel. Agency agreements were signed with U.K. and U.S.A. agents. In the U.K. Tamtech will distribute Seismic Streamers and in the New England States, Electronic Sales of New England will sell Deep Towed Sub-Bottom Profiling Systems and other geophysical equipment.

Exhibitions and conferences were attended in Houston, Aberdeen, Oslo, Brighton, Amsterdam, New Orleans and Halifax as part of the marketing strategy.

Export sales of hardware developed by NSRFC exceeded $1 million for 1983/84.

**Representatives**

**Tamtech Limited**
United Kingdom/Ireland

**MacArtney ApS and Co. K/S**
Scandinavia

**J. Bornhoft Industriegerate GMBH**
West Germany/Austria

**Geophysical & Scientific Equipment Ltd. (G.S.E.)**
United Kingdom

**Internationale Navigatie Apparaten (I.N.A.)**
Holland

**Nereides**
France

**Stewart Engineering**
New England States

**Techmation**
Belgium/Luxembourg

**T. Thompson Limited**
British Columbia/Alberta/
North West Territories/Hawaii/
Oregon/Washington

**Hydracon Company**
Gulf Coast

**Electronic Sales of New England**
New England

**Video Systems PTY Limited**
Australia

**Whitney Associates**
California

*Installation of Fluid Rotary Union Unit, Denmark*

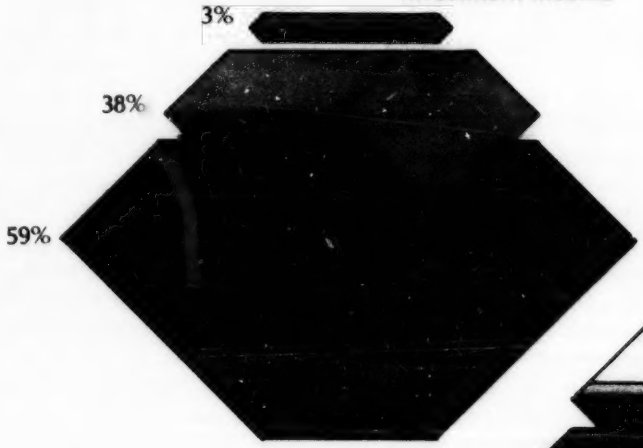
# Ocean Technology Production

Ocean Technology Production (OTP) coordinates the assembly, testing and quality control of the Nova Scotia Research Foundation Corporation's electrical slip ring and fluid rotary union products. Component manufacture for these products is contracted with local industry. Engineering and R&D are provided by the Corporation's Centre For Ocean Technology. Sales for 1983/84 continued to escalate with a 40 percent growth over 1982/83. Product marketing and sales are performed by the Corporation's Marketing Group.

# Revenue Overview

## Source of Revenue 1983/84

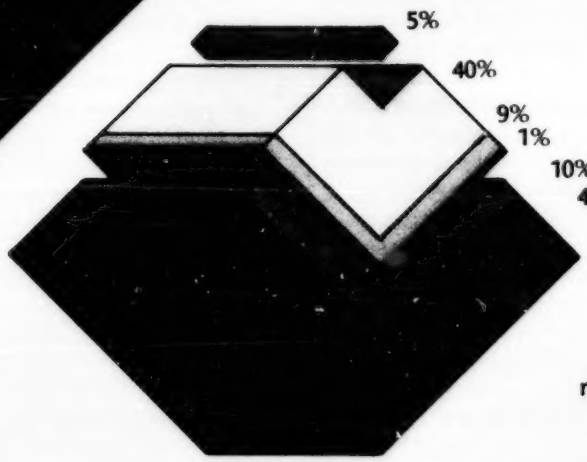
| | |
|---|---|
| Contracts | 59% |
| Grant— | |
| Province of N.S. | 38% |
| Investment Income | 3% |



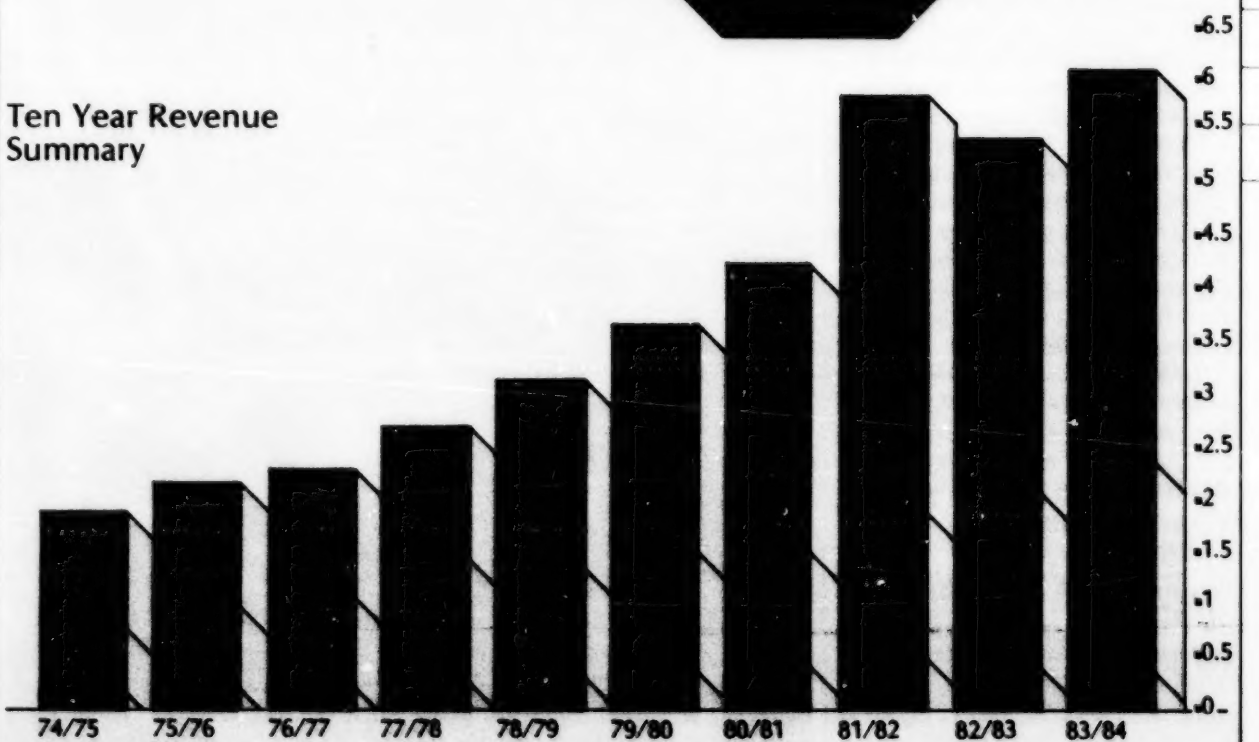

## Source of Contracts 1983/84
(by $ value)

| | | |
|---|---|---|
| **Industry*** | | 45% |
| Nova Scotia | 10% | |
| Rest of Canada | 4% | |
| Foreign | 31% | |
| **Government** | | 50% |
| Federal | 40% | |
| Nova Scotia | 9% | |
| Municipal | 1% | |
| **University** | | 5% |

*Includes Crown Corporations




## Ten Year Revenue Summary



## Auditor's Report

To the Chairman and Members
of the Board of Directors
of the Nova Scotia Research
Foundation Corporation

I have examined the consolidated balance sheet of the Nova Scotia Research Foundation Corporation as at March 31, 1984 and the consolidated statements of revenues and expenses and retained earnings for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these consolidated financial statements present fairly the financial position of the Corporation as at March 31, 1984 and the results of its operations for the year then ended, in accordance with generally accepted accounting principles, except for the method of accounting for fixed assets, as referred to in Note 1 to the financial statements, applied on a basis consistent with that of the preceding year.

O.P. Cormier, F.C.A.
Deputy Auditor General
Halifax, Nova Scotia
June 25, 1984

## Notes To The Consolidated Financial Statements For The Year Ended March 31, 1984

1. **Accounting Policies**

a) **Principles of Consolidation**
The consolidated financial statements include the accounts of Nova Magnetics Limited which is 100% owned by the Nova Scotia Research Foundation Corporation. The Corporation set up Nova Magnetics Limited on May 1, 1981.

b) **Inventory**
Supplies are valued at the lower of cost and net realizable value.

c) **Fixed Assets and Contributed Surplus**
Fixed assets are acquired by purchase and by donation. When fixed assets are acquired out of the general revenues of the Corporation, they are charged to expense in the year of acquisition.
For accounting purposes, the costs of all fixed asset additions, whether by purchase or donation, are recorded in the fixed asset account, with an offsetting credit to contributed surplus.
When fixed assets are constructed by the Corporation, the related material, labour and overhead costs are included as fixed assets in the year of expenditure.
When equipment is ten years old, the cost is removed from both the fixed asset and contributed surplus accounts.

2. **Capital Equipment Reserve**
In anticipation of capital equipment purchases, at significantly higher costs in future years, the Corporation set up a Capital Equipment Reserve by appropriations from Retained Earnings. The entire balance of this reserve was used by March 31, 1984.

# Financial Statement

## Province of Nova Scotia
## Nova Scotia Research Foundation Corporation
## Consolidated Balance Sheet As At March 31, 1984

| | | 1984 | 1983 |
|---|---|---|---|
| **Assets** | | | |
| **Current** | Cash | $ 86,898 | $ 57,792 |
| | Accounts receivable (net of allowance for doubtful accounts, 1984-$4,369; 1983-$3,170) | 1,027,862 | 1,213,399 |
| | Short term investments | 879,657 | 530,823 |
| | Inventory (Note 1) | 253,926 | 384,076 |
| | | 2,247,543 | 2,186,090 |
| **Research Endowment Fund** | Province of Nova Scotia 11% Promissory Note, payable November 25, 1984 | 1,000,000 | 1,000,000 |
| **Fixed** | Land and buildings | 2,843,267 | 2,843,267 |
| | Equipment | 1,462,462 | 1,156,412 |
| | | 4,305,729 | 3,999,679 |
| | | $7,553,272 | $7,185,769 |

| | | 1984 | 1983 |
|---|---|---|---|
| **Liabilities and Equity** | | | |
| **Current** | Accounts payable | $ 297,426 | $ 185,722 |
| | Trade | 1,164,204 | 991,794 |
| | Province of Nova Scotia | 91,823 | 137,000 |
| | Deferred revenue | | |
| | | 1,553,453 | 1,314,516 |
| **Research Endowment Fund** | Fund balance | 1,000,000 | 1,000,000 |
| **Equity** | Capital equipment reserve (Note 2) | | 111,038 |
| | Contributed surplus (Note 1) | 4,305,729 | 3,999,679 |
| | Retained earnings | 694,090 | 760,536 |
| | | 4,999,819 | 4,871,253 |
| | | $7,553,272 | $7,185,769 |

## Province of Nova Scotia
## Nova Scotia Research Foundation Corporation
## Consolidated Statement of Retained Earnings
## For The Year Ended March 31, 1984

| | | 1984 | 1983 |
|---|---|---|---|
| | Balance, beginning of year | $ 760,536 | $ 806,864 |
| | Less: Net operating loss | (66,446) | (46,328) |
| | Balance, end of year | $ 694,090 | $ 760,536 |

## Province of Nova Scotia
## Nova Scotia Research Foundation Corporation
## Consolidated Statement of Revenues and Expenses
## For The Year Ended March 31, 1984

| | | 1984 | 1983 |
|---|---|---|---|
| **Revenues** | Scientific and engineering | $3,593,900 | $3,285,327 |
| | Grant from Province of Nova Scotia | 2,356,600 | 1,824,000 |
| | | 5,950,500 | 5,109,327 |
| **Expenses** | Scientific and engineering | 4,941,080 | 4,226,348 |
| | Administrative and occupancy | 1,245,393 | 1,153,891 |
| | | 6,186,473 | 5,380,239 |
| | Net operating loss before investment income | (235,973) | (270,912) |
| **Investment Income** | Research Endowment Fund | 105,918 | 92,973 |
| | Short term investments | 63,609 | 131,611 |
| | | 169,527 | 224,584 |
| | Net operating loss | $ (66,446) | $ (46,328) |

# Applied Microelectronics Institute

The Applied Microelectronics Institute (AMI), a joint venture of the Technical University of Nova Scotia, Dalhousie University and the Nova Scotia Research Foundation Corporation, was established in 1981 to develop an outstanding technical competence in microelectronics and to use that competence to assist Nova Scotia industry to effectively utilize this powerful and pervasive technology. Initial financial support has been provided under the federal government's national microelectronics support program. In 1983/84, with assistance from the Ocean Industry Development Office of the federal government and the Ocean Industry Innovation Centre of the Nova Scotia Department of Development, AMI acquired a computer-aided design (CAD) system to assist in the layout of printed circuit boards. With this state-of-the-art facility the time required to lay out a board is reduced from days or weeks to a matter of a few hours, greatly enhancing productivity. A number of electronic companies in the province are already using the services provided by AMI and others are preparing to do so in the near future.

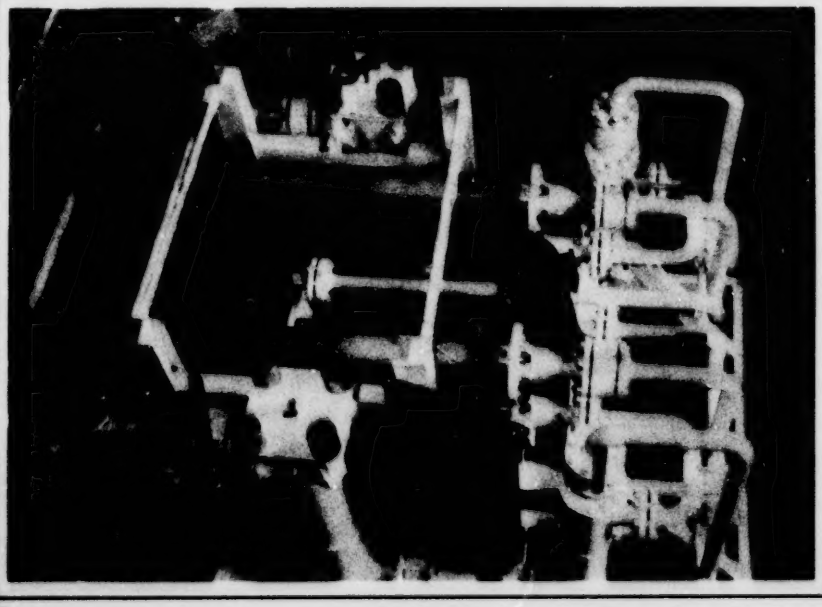
In a second major thrust, AMI, jointly with the Technical University of Nova Scotia, has been successful in obtaining a very large-scale integrated circuit (VLSI) design and test capability as part of a national program of the Canadian Microelectronics Corporation. With this capability AMI will be able to design custom-integrated circuits for research programs and provide "hands-on" training for engineering students in VLSI design technology.

**Glass Blowing**

Glass-blowing services are provided for industry and research laboratories in Atlantic Canada. Repair of milking jugs, construction of vacuum distillation rigs and repair or modification of laboratory glassware are a few examples of work undertaken.

**Instrument Shop**

The well-equipped shop works with the Corporation's scientists and engineers to produce prototypes for testing, evaluation and modification. Further requirements for hardware are contracted out to local industry.



*Hyperbaric Blowers installed at the Norwegian Underwater Technology Centre in Bergen, Norway*

# Nova Magnetics Limited

Nova Magnetics Limited is a wholly-owned subsidiary of NSRFC established in 1982 to develop the market potential for the magnetic coupling technology developed by NSRFC. NML products include a variety of magnetically coupled blowers capable of circulating gases in contained systems with no leakage to the external environment.

The recession in the United States, specifically the inactivity in the chemical processing and nuclear industries, had a negative impact on the market for NML products for most of 1983/84. At year's end several new orders provided a more encouraging outlook for 1984/85. An increased marketing effort is planned to develop new market potentials for NML's products.

Organizational changes included the appointment of Mr. T.B. Nickerson as President with retiring President Dr. J.E. Blanchard remaining on the Board of Directors.

The Nova Magnetics Board of Directors are:
Mr. T.B. Nickerson (Chairman)
*(President, NSRFC)*
Dr. J.E. Blanchard
*(Retired—NSRFC)*
Mr. D.H. Covill
*(President, Nautical Electronic Laboratories Limited)*
Mr. D.H. McKeough
*(Retired—Ferguson Industries Ltd.)*
Mr. P.M. Taiani
*(Associate Research Officer, NSRFC)*
Mr. C.R. Tyner
*(Director of Engineering Physics Division, NSRFC)*

The following Corporation personnel are the Officers of Nova Magnetics Limited:
Mr. T.B. Nickerson
*(President)*
Mr. C.R. Tyner
*(Vice-President and General Manager)*
Mr. J.A. Gillis
*(Vice-President, Marketing)*
Mr. R.F. MacNeill
*(Secretary/Treasurer)*

**Administration**

**President**
T.B. Nickerson
*B.Eng., M.Sc., P.Eng.*

**Secretary to the President**
N.J. Gerogiannis

**Consultants**
J.E. Blanchard
*B.Sc., M.A., Ph.D., F.R.S.C.*
J.A. Brothers, *B.Sc., M.Sc.*
C.N. Kennedy
P.N. Taiani

**Manager of Administration**
R.F. MacNeill, *B.Sc., B.Comm.*

**Secretary to Administration**
S.J. Drover

**Accounting**
K.J. Hornsby
R. Chaffey
E.M. Marr
H. Pelton

**Building Services**
G.E. Fraser
J.F. Brown
M. Crawford
G.E. Dean
D.K. Julien
E.W.M.H. Maessen
R. Reid
R. Trenchard
F. Walsh

**Carpentry Shop**
R.C. Fraser

**Purchasing and Shipping**
W.G. LeRue
J.M. Foster
J. Pelton

**Support**
B. Gandhu
J. Parent

**Glassblower**
R. Maxwell

**Instrument Shop**
C.E. Isenor
R. Conrod
A.B. Johnson
L.R. Hartlen
D.W. Haskins
R.A. Marks

**Head of Marketing**
J.A. Gillis, *B.Sc., B.Ed., M.B.A.*

**Secretary to Marketing**
J.P. Cranford

**NSRFC Staff Member at AMI**
A.G. Jost, *B.Sc., M.Sc., Ph.D.*

**Industrial and Information Services**

**Director**
J.R. Helliwell, *A.C.S.M., P.Eng.*

**Professional**
IRAP-C Field Advisory Service
G.R. Archibald, *B.Eng., P.Eng.*
J.P. Archibald
*B.Sc., B.Eng., P.Eng.*
I.W. Glass, *B.Sc., P.Eng.*
J.J. Marshall, *B.Eng., P.Eng.*
D.W. Martell, *B.Eng., P.Eng.*
R.S. McVittie, *B.Eng., P.Eng.*
B. Rapson, *B.Sc., M.Sc., P.Eng.*
J.D. Stacey, *B.Eng., P.Eng.*

**Project Services**
J.D. MacAulay
*B.S.A., M.Sc., Ph.D., P.Ag., P.Eng.*
R.L. Roberts, *B.Sc., M.B.A.*

**Operational Research**
I.L. Hawboldt, *B.Sc., M.Sc.*
C.H. Park, *B.Sc., M.Sc., P.Eng.*

**Library**
H.I. Hendry, *B.A., B.Lib.Sc.*

**Technical**
J.F. Fitch, *B.S.A.*
H.A. Kornuta, *B.A.*
M.C. MacDonald, *B.A.*
M.W. Veling, *B.Sc.*

**Secretarial**
C.L. O'Connell
J.L. Stewart

**Ocean Technology Production**
P.M. Baker
W. Jodrey

**Engineering Physics/Centre For Ocean Technology**

**Director**
C.R. Tyner, *H.N.C., P.Eng.*

**Professional**
Electronic Engineering
J. Osborne, *B.Sc., A.R.C.S., P.Eng.*
L.P. Coulman, *B.Sc., P.Eng.*

Mechanical Engineering
G.H. Channer, *H.N.C., P.Eng.*
E.A. Smallhorn, *B.Eng., P.Eng.*
W.W. Spencer
*B.Eng., M.Eng., P.Eng.*
N.P. Richter, *B.Eng., P.Eng.*

**Technical**
W.T. Bond
C. Dickinson
H.G. James
N. McFeters
A.P. Melanson, *BASc.*
W. Mills
R.G. Morash, *B.Sc.*
J.B. Oliver, *B.Sc.*
H. Parusel
R.W. Tizzard, *B.Sc.*
R. Warnell

**Secretarial**
S. Williams

**Geophysics Division**

**Director**
D.E.T. Bidgood, *B.A., M.A., Ph.D.*

**Professional**
Marine Geophysics
D.S. Rankin, *B.Sc., Ph.D.*
D.D. Prentiss, *B.Sc., P.Eng*

Ground Geophysics
K. Howells, *B.Sc., Ph.D.*
A.G. McKay, *B.Sc., M.Sc.*

**Technical**
P.A. Beech
E.D. Clarke
D.J. Doucett
R.H. Edsall
R.J. Harris
D.F. Hornsby
G.L. Melling
L.E. Pelletier, *B.Sc., B.Ed.*
F.M. Smith
L.G. Tufts

**Secretarial**
G.P. Woodgate

**Chemistry Division**

**Professional**
Analytical Services
M.J. Firth
J.W. Thorpe, *B.Sc., M.Sc., Ph.D.*

Metallurgical Testing and Corrosion Research
T. Betancourt
*B.Eng., M.Eng., P.Eng.*
A. Kazi
*B.Sc.Eng., M.Eng., Ph.D., P.Eng.*
M.L. Robicheau, *B.Sc.*

Coal Conversion
D.M. Jay, *B.Sc., P.Eng.*
J.K. LeDue, *B.Sc.*
J.J. Starzomski, *B.Sc.*

Coal Desulphurization—Pyrolysis
A.L. Crandlemire, *B.Sc.*
N.S. Stover, *B.Sc., M.E. Sc., P.Eng.*

Technology Development
G.D. Lutwick, *B.Sc., M.Sc., Ph.D.*

**Technical**
H.F. Ballum
R.K. Boss, *B.Sc.*
W.E. Dearman, *B.Sc.*
L.D. Giffin, *B.Sc.*
W.R. Gillis, *B.Sc.*
P.C. Malley
R.G. Mombourquette
R.E. Skinner, *B.Sc.*
J.E. Sponagle, *B.Sc.*
H.E. Stillman, *B.Sc.*
S.G. Thomas

**Secretarial**
S.R. Cash, *B.E.M., B.Sc.*

**Biology Division**

**Director**
K.E. Hellenbrand, *Ph.D.*

**Professional**
Fermentation, Food and Industrial Microbiology
A.E. Reade, *B.Tech., Ph.D.*

Plant Physiology
Plant-Microbe Interactions
C.D. Boyle, *B.A., B.Sc., M.Sc.*

Environmental Microbiology, Nitrogen Fixation
W.J. Robertson, *B.Sc.*

**Technical**
K.L. Gunn
K.E. Spencer, *B.Sc.*
G. Shatz-Selig, *B.Sc.*

**Secretarial**
J.M. Colpitts

*Staff as at March 31, 1984.*

POOR

QUALITY

ORIGINAL